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AND THEIR RELATION TO CEREBRAL COMPLICATIONS.

BY

S. MacCUEN SMITH, M.D.,

LECTURER ON OTOLOGY AND CHIEF OF AURAL CLINIC, JEFFERSON MEDICAL COLLEGE, OF PHILADELPHIA; SURGEON IN CHARGE OF THE EAR AND THROAT DEPARTMENT OF THE GERMANTOWN HOSPITAL, PHILADELPHIA, ETC.

REPRINTED FROM THE TRANSACTIONS
OF THE PHILADELPHIA COUNTY MEDICAL SOCIETY,
APRIL 26, 1893.

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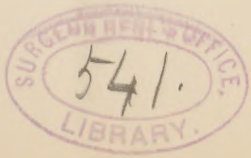
[Read April 26, 1893.]

In bringing the subject of this paper before you this evening it is with the hope that one of the many urgent subjects of otology may be so clearly presented, in connection with the discussion which follows, as to deeply impress the busy practitioner with the importance of the early recognition and treatment of aural diseases in general.

We think it is an admitted fact that of all human ailments diseases of the ear have been the most neglected.

From the early days of medicine to the present time aural diseases have largely fallen into the hands of cunning quacks, who, through their hocus-pocus methods, have mystified the always gullible public. In fact, the science of otology has been reduced almost to the primitive teachings of the dark ages, when it was declared by the expounders of ancient wisdom that urine of the male and female, respectively, would cure ear diseases in the opposite sex, and that inflammatory conditions of the ear might be alleviated by one of their pharmaceutical specialties, composed of "the delicate admixture of the excrement of pigeons and the ashes of horses' dung, to which might be added finely pulverized black pepper."

Judging from the statements of patients, there still exists among some of the profession a belief, which is largely shared by the laity, that something mysterious or magical surrounds the diseases of the ear and their treatment. With this opinion prevalent we cannot express surprise at many of the unfortunate sufferers volunteering the information that they had been advised to "*Let well enough alone;*" "*it is bad to meddle with the ears;*" "*do not tamper;*" "*never heal a running ear or it will go to the brain and kill you.*"



It is also of daily occurrence to find that the syringe has been roughly used to throw a stream of water on an *exposed drumhead*, or that the popular but uncleanly habit has been suggested and followed of dropping greasy and other fungus-generating fluids into the ears.

This evident lack of information is, of course, due to the fact that in former years in many of our medical colleges otology had received only the minimum consideration, while in some institutions this most important branch of medicine had not even been mentioned in their curriculum. So long as students are not required to pass an examination on aural or other diseases it will be found that their knowledge of the same is almost *nil.*

It is indeed gratifying to be able to note the increasing interest and demand for special instruction on the ear and its diseases. To the recent graduate in medicine a knowledge of this branch now becomes imperative, as many of the State Examining Boards require applicants to pass an examination on otology.

From a medico-legal standpoint the subject is of the utmost importance, for certainly the time is not far distant when it will be regarded as illegal for one to so neglect a suppurative disease of the tympanum (either acute or chronic) that fatal cerebral complications result therefrom. Brain abscess and meningitis, as the result of ear diseases, are in the great majority of cases preventable. It, therefore, becomes the imperative duty of every practitioner of medicine to properly diagnose and treat such cases. This duty is especially important to the physician of general practice, inasmuch as he is usually the first to be consulted, and his direction and care of the patient at that critical time is often of vital importance.

In order to give an idea of the importance of ear diseases in their relation to general medicine and the responsibility and duty of the profession at large to the public, it will be interesting to note that it has been estimated by various authors that from 43 to 76 per cent. of all brain abscesses arise, either directly or indirectly, from suppurative disease of the middle ear. To this I should like to add that the same figures would probably not exaggerate the large number of cases of meningitis and pyæmia which, on account of their doubtful etiology, are termed and accepted as "obscure." Barker, as quoted by Keen and White, estimates that not far from two thousand deaths, caused by diseases of the ear, annually occur in Great Britain, with a population of little more than one-half that of the United States.

These are, indeed, impressive figures, and are especially deserving of serious consideration, from the fact that there are annually dying in the United States probably four thousand of her

inhabitants from brain abscess, the direct cause of which is some pathological change in the ear. Our belief is that should these cases receive early recognition and proper care the mortality, at least, would be greatly reduced and the fatal complications in most cases be prevented.

As a rule, an acute inflammation of the tympanum is painful in the extreme; and yet it must not be forgotten that we will at times find a case where the membrana tympani will rupture, with the consequent flow of discharge, which will be the first and only symptom to attract the patient's attention. These cases, however, yield promptly to treatment, unless dependent upon some enfeebled condition of the constitution. On account of the symptoms not being urgent they attract but little or no attention, and, therefore, are allowed to form a good foundation for a chronic purulent suppuration with all its possible serious consequences.

An acute suppurative otitis media is usually the result of the acute non-suppurative variety (commonly known as earache) the symptoms of which briefly are, a sense of fulness in the head accompanied by more or less tinnitus and so-called "neuralgia." In my experience these symptoms precede the real pain several hours, or in some cases it may be several days. The pain, which is very severe, generally occurs at night, and is referred to the ear and along the Eustachian tube. In most cases considerable fever is present, and marked impairment of hearing. As the pus accumulates the bulging outward of the membrana tympani correspondingly increases, and the tension resulting therefrom intensifies the pain almost beyond endurance. It is in this state or stage of the disease that immediate relief is so earnestly demanded for the present and future welfare of the unfortunate sufferer.

Should the patient have the good fortune to have the distended drum promptly punctured in order to promote the free escape of pus, and this followed by gentle inflation through the Eustachian tube, together with general antiseptic care and the use of leeches, the hearing will in most instances be quickly recovered, the discharge will cease, and all the functions of the organ will soon be re-established.

If, however, the pus is not promptly evacuated the patient is in imminent danger of one or more of the serious consequences that follow such neglect. Should the drum be so thickened and bound down by adhesions as to enable it to resist the pressure, as is sometimes the case, the pus will then, by one of the several means of communication, produce a septic inflammation of the brain or its coverings,

which usually has the result of a prompt fatal issue. Or the pus may communicate with the mastoid antrum, thence to the mastoid cells, thereby subjecting the patient to all the serious, and ofttimes fatal, complications of such a condition.

Fortunately, however, these implications are not of frequent occurrence from acute suppurative otitis media, for, in neglected cases Nature has wisely provided a drum that will usually rupture of its own accord when the pressure from accumulated pus reaches the dangerous point; or, as it occasionally does, the pus finds an exit through the Eustachian tube into the throat. This is particularly the case in children, because the calibre of the tube is proportionately much larger in early life.

Brain and mastoid implications arising from a suppurative inflammation of the ear are in nearly all cases a result of the chronic variety, although I have seen several fatal cases from the acute suppurative form. There is usually a history of chronic discharge, frequently even extending over many years. At times the "running" will cease, and the physician and patient (if he be under treatment) will congratulate themselves on the apparent success of their therapeutics, when quite unexpectedly the patient again applies for relief from a severe pain in the ear, caused either by exposure to cold or wet, or it may be from some trivial accident, such as a slight blow upon the ear or head.

Any patient suffering from a suppurative otitis media, be it of the continued or recurrent form, is in constant danger (either from exposure to cold or traumatism) of a fatal termination. "Many apparently unaccountable cases of fatal coma are explained in this way; an old cerebral abscess, which has already lasted weeks or months without giving rise to any definite symptoms, suddenly giving way and bursting into the ventricular or subarachnoid space." It is, therefore, a safe and wise rule, as well as duteous teaching, to regard every person with a discharging ear as being in such a condition that serious, or even fatal, complications may arise on the slightest provocation.

Recent bacteriological investigations demonstrate beyond question that the quantity and especially the quality of the discharge are all-important factors in considering the prognosis of individual cases. The popular impression is that so long as a discharge is copious and devoid of fetor it is harmless, and of such little moment as to demand treatment only from a point of tidiness or inconvenience. This belief, notwithstanding its almost universal acceptance, is misleading

and is calculated to cause in the future, as it has done in the past, much misfortune.

It is entirely true that in a freely "running ear" we have present the best possible condition to prevent brain complications, and yet we must not lose sight of the fact that a decrease in the discharge, and especially if it should stop suddenly, must be viewed with some degree of alarm, inasmuch as sudden or even more gradual decrease in the flow is frequently caused by inspissated masses of mucus and pus collecting behind a wall of dried and hardened epithelium intermixed with pus, and entirely occluding the opening in the ruptured drum, consequently preventing the escape of discharge, which continues to form until the accumulation causes much pressure, and brain or mastoid complications may be the result.

Generally speaking, a discharge of pus without fetor is considered harmless, and, therefore, in most cases receives little or no notice, unless for cosmetic purposes. Although the number of observations on the pathology of the putrefactive changes within the ear have been limited and confined to the researches of only a few investigators, sufficient information is at present made known from the recent discoveries in micro-biology to establish the fact that non-fetid pus from the ear contains large quantities of pathogenic cocci, and is, therefore, highly infectious and dangerous to life. In fetid pus it is true that cocci are also found, but they are of the diplococci variety, and the bacilli, which are also present, largely predominate.

Barker, who has given this subject much thought and study, writes as follows: "From his inoculations of animals with cultivations and pus emulsions Rohrer came to the conclusion that the various forms of bacilli found in the fetid secretions of the ear were not pathogenic but simply saprophytic, the animals inoculated with the bacilli either in the tympanic cavity, the auricular veins, or the peritoneum, being alive and well at the end of some months, little or no action having taken place locally. But of the pathogenic nature of the cocci there could be no doubt from his experiments on animals, typical septic diseases of various kinds being produced without fail. These observations appear to me to possess a special interest as regards the question of fetor from the ear. It has been commonly taught hitherto that a bad smell from the ear is an important factor in the prognosis of aural inflammations. My own observations, however, for a long time past have led me to question this conclusion very seriously, and to hold and teach that some of the most dangerous sequelæ of otitis media may be met with where the secretions from the tympanum are either nearly or quite odorless."

"If this be true, and I fully believe it to be so, the explanation is found in Rohrer's observations regarding the pathological cocci found alone in the non-fetid discharges, and the preponderance of merely saprophytic bacilli in the fetid. We must not, therefore, think the less seriously of a discharge from the ear because it is odorless, but must endeavor to get rid of its exciting cause just as strenuously as if it were most offensive. This is only what we might expect from an experience of ordinary suppurating wounded surfaces in other parts, which in many cases give rise to serious or fatal septic complications without giving off any fetor."

Caries and necrosis are a frequent and serious complication of suppurative otitis, and are produced by ulceration of the inflamed mucous membrane of the tympanum, by extending to the deeper layers of that membrane (which act as the periosteum on the inside of the osseous cavities) and finally attacking the bone itself.

Politzer describes the process as "an infiltration of round cells into and around the fibrous tissue which penetrates the substance of the bone as offshoots from the mucous membrane. These round cells may undergo three transformations: they may break up and be absorbed, they may be converted into connective tissue in which depositions of lime may take place, and we then have a thickening of the bone, or they may, by degeneration and erosion, produce an ulcerative osteitis. This ulceration may be due to constitutional taint, or to retention and decomposition of secretion, or to the catarrhal ulceration and wasting of the mucous membrane."

As the carotid canal (through which passes the carotid artery) forms the anterior wall of the tympanic cavity, and the jugular fossa (in which lies the bulb of the jugular vein) constitutes the floor of the tympanum, it will be readily seen why dangerous and even fatal hemorrhage may occur as the result of caries and necrosis of the middle ear. The bony walls of the tympanum are always thin, and in some cases the roof is entirely absent. The middle and back part of the temporo-sphenoidal lobe and the outer and front part of the lateral lobe of the cerebellum are in direct contact with the middle ear. Knowing this intimate relation of the tympanic cavity to the brain to exist, it does seem surprising that many more fatal results from imflammatory diseases of the temporal bone are not recorded.

As the skin of the external auditory canal (being somewhat modified) is continuous with and forms the outer layer of the membrana tympani, suppurative otitis media may be set up from without as well as by infectious matter reaching the tympanum through the Eustachian tube, the mucous membrane of which is continuous with

that of the throat and forms the inner layer of the drum. And, as many of the mastoid cells lie below the level of their opening into the middle ear, and the floor of the tympanum is in part below the orifice of the Eustachian tube, it will be seen how a suppurative disease of the tympanic cavity, or even the mastoid cells, may continue in a chronic state for months or years.

In suppurative otitis media brain abscess may be induced by direct continuity of structure, or the infectious matter may be communicated to the dura mater, causing subcranial abscess or diffuse meningitis, or to the bloodvessels in the diploë giving rise to osteo-phlebitis, thrombosis of the lateral sinus, or pyæmia. Or, as is the case in suppurative otitis externa, likewise in neglected otitis media, the pyogenic germs may find their way between the opening formed by the non-union of the vaginal and mastoid processes, thus producing a superficial mastoid abscess.

Through carious involvement of the malleus and incus there is frequently a direct communication between the tympanum and the mastoid antrum and cells, this being the usual way in which pus invades these cavities and forms a true or deep mastoid abscess.

There are many other routes along which the infection may travel; it may extend through the hiatus fallopii or the aqueductus vestibuli, or down the internal auditory meatus, or it may extend along some of the numerous small veins which run between the internal and middle ear, on the one hand, and the dura and pia mater on the other.

I will now briefly relate one interesting case of mastoid disease following an acute suppurative otitis media.

On March 26th, 1892, I was called to see Mrs. L. B. and found she had been suffering from a severe pain in her left ear and head for two weeks. On inspection nothing could be seen that would suggest a forming abscess of the middle ear, and as the pain in the head was so general it quite deceived the attending physician. On examination through the meatus we found a greatly inflamed drum and bulging of Shrapnell's membrane. We immediately opened the drum, which allowed a free escape of pus and greatly relieved the patient's pain. This was followed by leeches in front and blisters behind the ear; after which hot poultices were applied to promote suppuration. From this line of treatment entire relief was obtained for five weeks (but the ear continued to discharge), when pain was complained of over the mastoid; in fact, it involved the entire left side of the head.

The usual active measures were at once adopted to relieve pain, but the brief cessation of suffering was only while under the influence of drugs. (It is well to state that neither the mastoid nor any part of the head showed any evidence of either redness or swelling.) Three weeks later she expressed her willingness to submit to an operation, and, with the kind assistance of Dr. J. M. Barton, I opened the mastoid cells, evacuated the pus, and found,

by using the syringe, that the opening in the mastoid communicated with the external auditory canal. This established perfect drainage, which relieved the patient of all pain and discharge, but the hearing was found to be destroyed.

In August we removed the drum and ossicles, which resulted in the almost immediate restoration of her hearing, which remains normal at this writing.

As all inflammatory conditions and abscesses of the brain are most serious, and especially so when dependent upon diseases of the temporal bone, it, therefore, becomes our imperative duty to make every effort to prevent these unfortunate complications, rather than to hope for their relief after having once developed.

It is not the object of this paper to enter into the subject of treatment from a general surgical point of view, but simply to offer such suggestions as are thought to be in a measure preventive, for it must now be admitted that many of the serious complications arising from diseases of the ear have much to commend the probability of their being preventable. As already shown, the majority of brain and mastoid diseases are due to a suppurative disease of the typanum, and are usually the result of the chronic form of discharge.

Most cases when applying for treatment give the history of a "running ear" extending over months or years, and that it has resisted treatment in the hands of many competent physicians. In cases of chronic discharge from the ear that do not yield to due and proper care it is now our rule to advise the removal of the drum and one or more ossicles.

By this surgical procedure we establish a free drainage and make an opening into the typanum sufficiently large to admit of the site of the disease being properly treated by antiseptic washes and applications, and, if this interference be established before brain or mastoid complications have set in, these developments will almost surely have been prevented; besides, the discharge in nearly all cases will cease, and the hearing in the majority of patients greatly improve, while in others it becomes quite normal.

Or, if you have a case presenting symptoms of cerebral irritation or abscess where there is a chronic "running ear," and it does not yield promptly to the above measures in conjunction with leeches to the mastoid, etc., it may be due to pus confined in the mastoid antrum, and no time should be lost in making an incision over the mastoid and trephining the same half an inch behind and above the centre of the external meatus. Within the past year I have seen five cases relieved by this method of treatment. In suspected mastoid disease an incision down to the bone is often delayed too long, and, perhaps, is never done too soon.

1502 Walnut Street.